RAE Systems

How well do you know your ToxiRAE 3?

Presented by David Lucha
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How well do you know your ToxiRAE 3

Objective

- Understand why user are having issues / difficulties with their ToxiRAE 3
  - Battery issues
  - Excessive alarms
  - How to calibrate
  - Replacing the battery

What to Know

- Understand how the end user will operate the ToxiRAE 3
- Who is the end user
- What is the end users environment?
  - Industrial / Petro-Chemical – H2S
  - Fire / Hazmat - CO
  - Other – CO or H2S

TOP Questions about ToxiRAE 3

#	Question
1	Unit turns on, then turns off.
2	Battery not lasting, WHY?
3	Purchased instrument about a year ago, battery low. How come?
4	Unit in alarm, how come?
5	After I turned on my Unit it is Reading 686 ppm on the display
6	Unit reads NEG on display. How come?
7	Unit is blinking CAL, what does that mean?
8	I don't have calibration gas. No one told me I had to calibrate.
9	Event logger, the date & time reads zero.
10	Do I need an AutoRAE Lite to reset my Date/Time
11	What is the password?

How well do you know your ToxiRAE 3

- Specifications
- User Interface
  - Configurations
- Turning On the ToxiRAE 3 – NORMAL Mode
- Calibration
- Diagnostics Mode
- Troubleshooting
  - Troubleshooting matrix
  - Answers to Top Questions
  - Alarm signals / Error Messages
  - Disabling / Turning OFF Alarms
- Replacing Battery
- Replacement Parts
- Warranty Matrix

Specifications

ToxiRAE 3 Specifications

Configuration	Diffusion single-gas with event logging for up to 10 events
Dimensions	3.4" L x 2.2" W x 0.8" H (8.6 cm x 5.5 cm x 2.0 cm)
Weight	3.5 oz (99 g) with battery
Battery	User-replaceable 2/3 AA high-capacity lithium
Alarms	• 95 dB (at 30 cm) buzzer and flashing red LED to indicate exceeded preset limits • High: Displays "High" and emits 3 beeps and flashes per second • Low: Displays "Low" and emits 2 beeps and flashes per second • STEL: Displays "STEL" and emits 1 beep and flash per second • TWA: Displays "TWA" and emits 1 beep and flash per second • Vibration alarm • 6-LED visible alarm
Operating Time	2 years, without IR communication usage

Specifications

Display	LCD
Keypad	2 programming/operation keys
Direct Readout	Measured gas value with sensor name, battery charge, high and low value, elapsed time, and event logging on/off state
Sampling Method	Diffusion

Range & Resolution

Sensor	Range (ppm)	Resolution (ppm)
H_2S	0 to 100	0.1
CO	0 to 500	1
CO	0 to 1999	1

Datalogging	10 events
Response Time	T90 < 12 seconds
Calibration	Two-point calibration for zero and span
IP Rating	IP-67
Protection:	Password protected calibration settings, alarm limits, and data
Certification:	US and Canada: C1D1, Groups A, B, C, D, T4 Europe: ATEX II 1G EEx ia IIC T4 IECEX: Ex ia IIC T4
Operating Temperature	Continuous: -20° C to +60° C
Humidity	0 to 95% relative humidity (non-condensing)
Warranty	2 years, including sensor and battery if used within specs

Specifications – Operating Time

Detector Specifications* - ToxiRAE 3 Datasheet

Battery	***User-replaceable 2/3 AA high-capacity lithium***
Warranty	***2 years, including sensor and battery if used within specs***

Detector Specification – ToxiRAE 3 – User Manual – Rev E

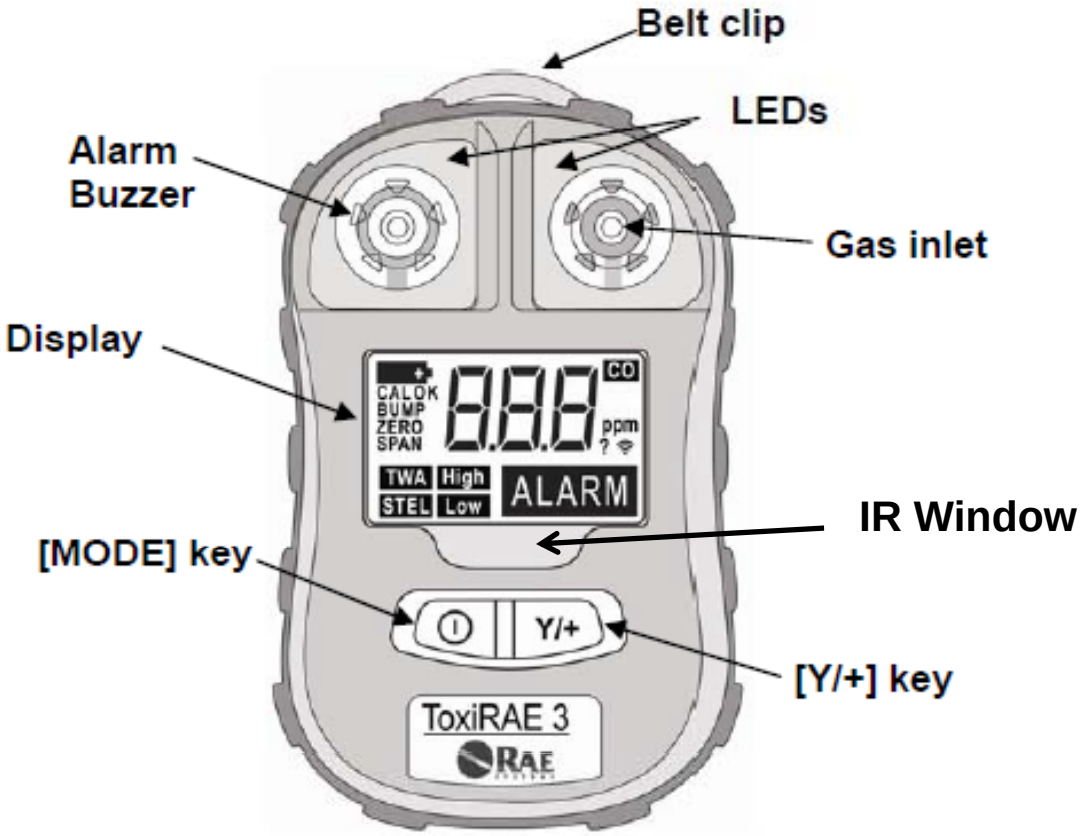
Battery	***User-replaceable 2/3 AA high-capacity lithium***
Warranty	***2 years, including sensor and battery if used within specs***
Operating Time	***2 years, without IR communication usage***

Detector Specifications – ToxiRAE II – User Manual

Battery	***User replaceable 2/3 AA high capacitance Lithium battery***
Warranty	***2-year warranty for instrument and CO/H2S sensors (all other sensors 1 year).***
Operating Period	***2 years typical battery life when used 8 hours/day with less than 5 minutes of alarms per day. 2 years typical.***

User Interface

The ToxiRAE 3's user interface consists of the display, LEDs, an alarm buzzer, and two keys, [MODE] and [Y/+]. The LCD display provides visual feedback that includes calibration or bump request, sensor mode and battery condition.



Configurations

Programmed to operate in either of two configurations:

Display Mode

- In Display Configuration, it is programmable and can be turned **on** and **off.**
- 3 Operational Modes
  - Normal
  - Programming
  - Diagnostic

Countdown Mode

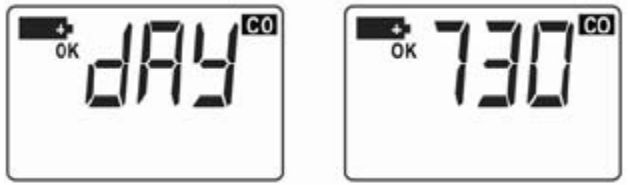
- In Countdown Configuration, it operates continuously from the time it is turned on and cannot be turned off until the sensor is depleted.
- Cannot be Turned-Off
- Display show number of days remaining until the sensor is expected to stop working
- Displays ppm reading only when in alarm.

Modes of Operation

<u>Programmed to operate in either of two configurations</u>:

Display Mode

Countdown Mode



- *Both Modes allow you to turn on IR communication*
- *Changing Modes can only be performed using the AutoRAE Lite.*

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- Diagnostics Mode
- Troubleshooting
  - Troubleshooting matrix
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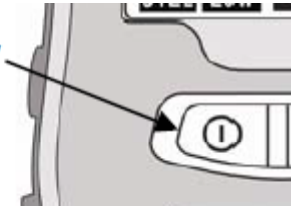
- Replacing Battery
- Replacement Parts
- Warranty

Turning On the ToxiRAE 3 – NORMAL MODE

1. With the ToxiRAE 3 turned OFF, Press and HOLD the [MODE].



2. When the display turns on, release the key. The buzzer and LEDs are tested and the display shows “On.”

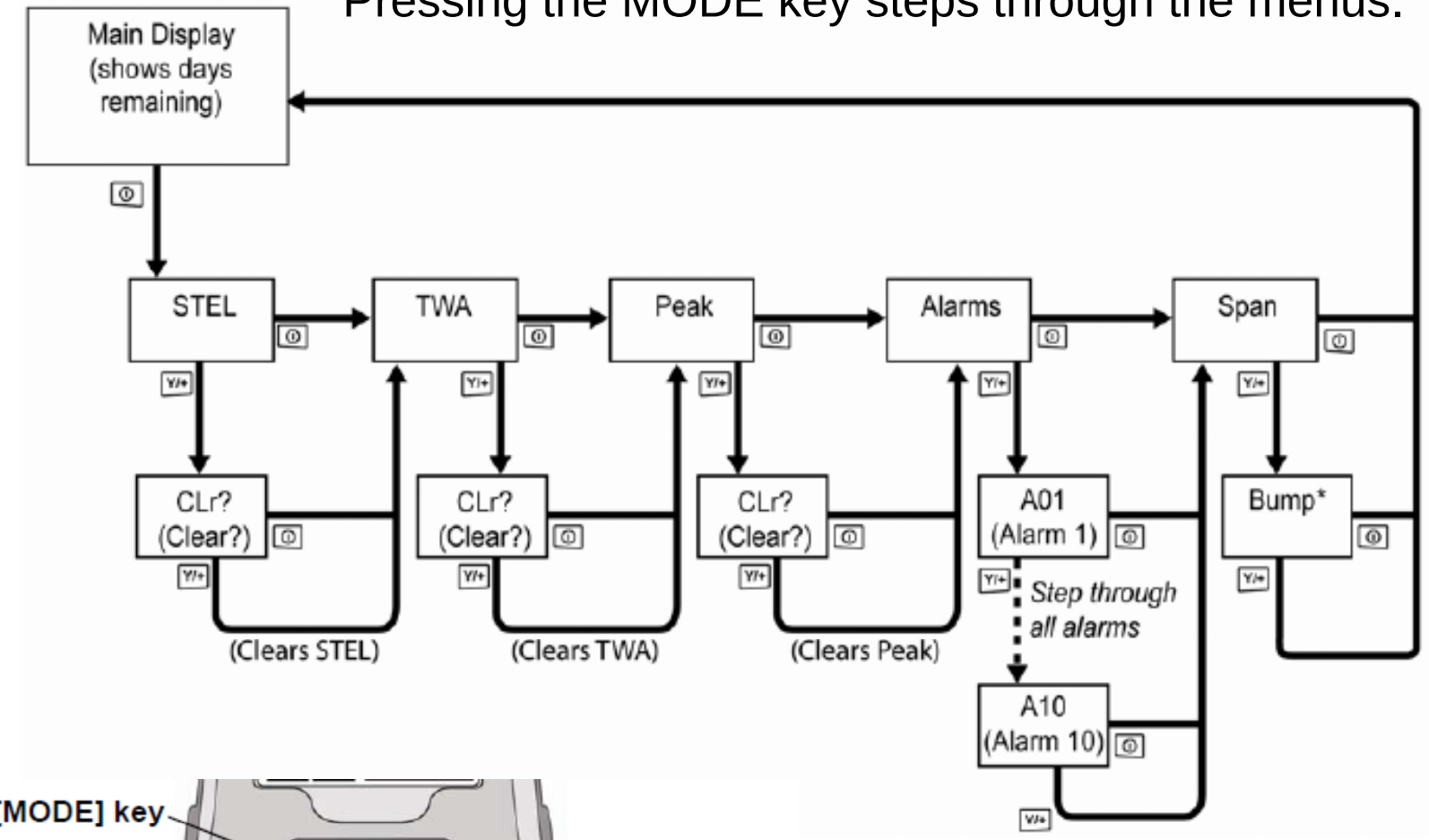
3. The display then shows the Firmware version.

4. The display then begins its Countdown from 30 seconds.

NOTE: User Press the MODE & Y/+ accidently , turning the unit on in the diagnostic mode. Display reads RAW Reading. 686.

Navigating through the ToxiRAE 3

Pressing the MODE key steps through the menus.



How well do you know your ToxiRAE 3

- Specifications
- User Interface
  - Configurations
- Turning On the ToxiRAE 3 – NORMAL Mode
- Calibration
  - Enter Programming Menu & Navigation
  - Zero Calibration
  - Span Calibration
- Diagnostics Mode
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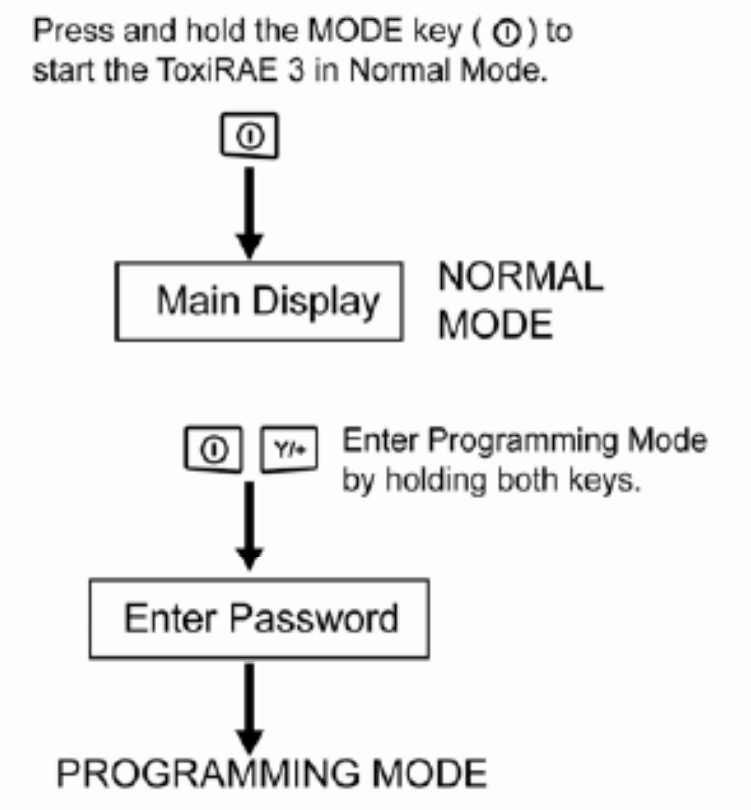
Enter Programming MODE

Programming Mode can be entered from Normal Mode or Diagnostic Mode. This mode contains most adjustable settings for the ToxiRAE 3. It is organized into nine submenus:

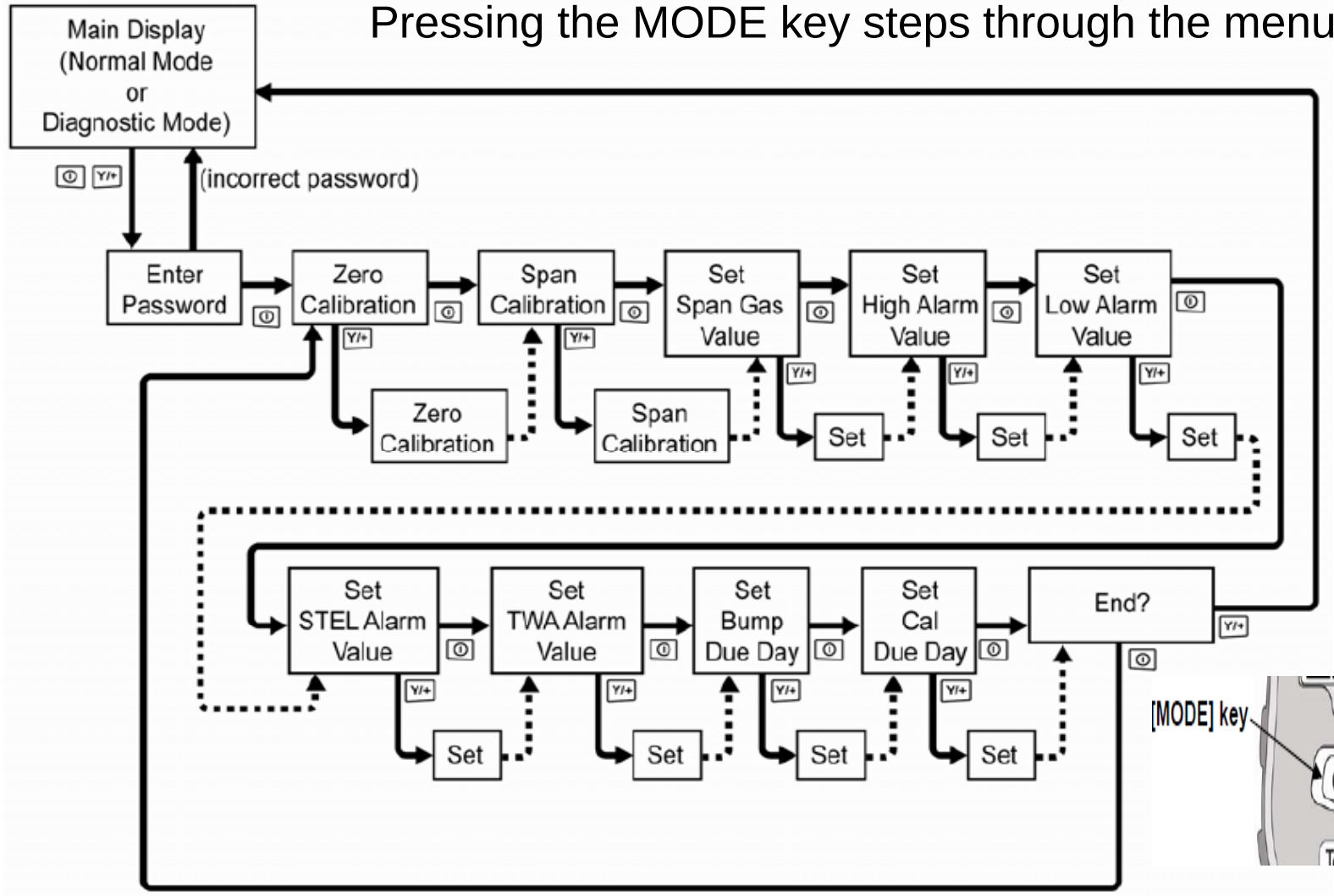
- Zero calibration
- Span calibration
- Set span gas value
- Set high alarm value
- Set low alarm value
- Set STEL alarm value
- Set TWA alarm value
- Set Bump Due day
- Set Calibration Due day
- End (exit)

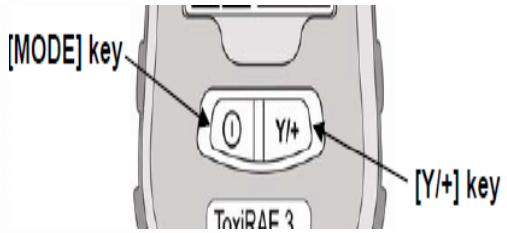
Note: The default password is 111.



Navigating in the Programming Menu

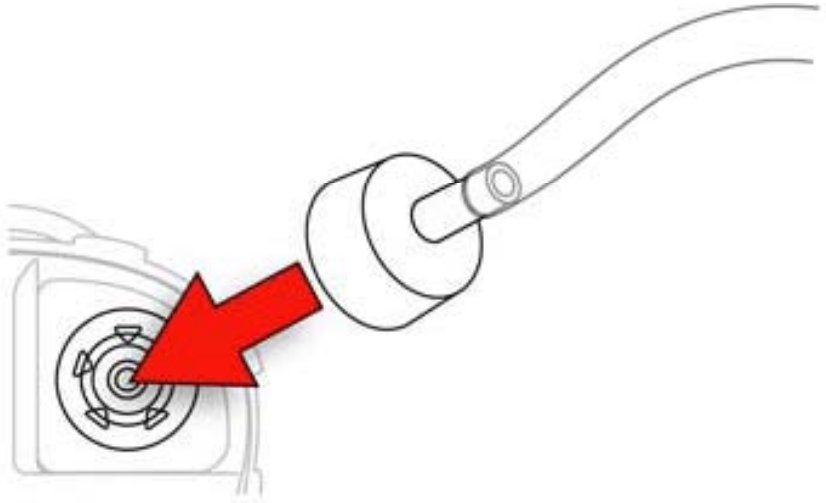
Pressing the MODE key steps through the menus.





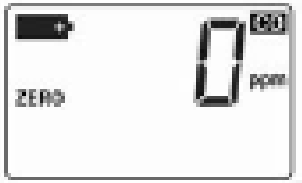
Calibrating the ToxiRAE 3 - Manually

- The ToxiRAE 3 is a diffusion monitor and must be calibrated using fixed-flow regulator with a flow rate between 0.5 and 1.0 liters per minute.
- The ToxiRAE 3 is supplied with a special calibration adapter that cover the gas diffusion port.
- If the local air has impurities that might interfere with the zero (fresh air) calibration, a cylinder of zero air should be used with the calibration adpater.



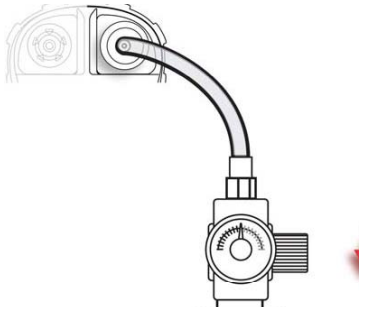
Calibrating the ToxiRAE 3 – Zero Calibration

- Turn on the ToxiRAE 3
- Enter the programming Mode.
- Press and hold the [Y/+] and [Mode] .
- Enter the password (the default is 111)
- Press the [Y/+] to begin the Zero Calibration countdown.
- When the countdown reaches “0”, the display alternates between “0” and “dn” (for done).
- Upon completing the zero calibration, the ToxiRAE 3 automatically advances to the span calibration menu.



Calibrating the ToxiRAE 3 – Span Calibration

- Before starting a Span Calibration, connect the gas cylinder, flow regulator and Calibration adapater to the ToxiRAE 3.
- Start the gas flow.
- Press [Y/+]. The 60 second countdown starts. This indicates the span calibration is taking place.
- When the countdown reaches “0”, the display alternates between “dn” for done and:
  - “50” for CO Monitors
  - “25” for H2S Monitors
- Upon completing the Span Calibration, the ToxiRAE 3 automatically advances to the next menu.

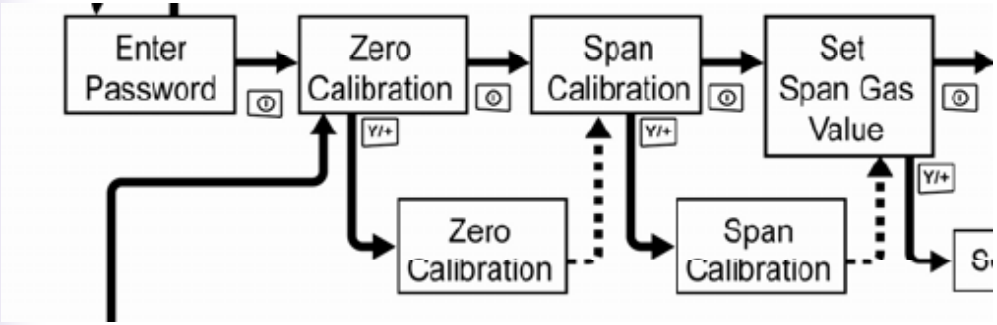


Calibration Fails

What happens if the Span Calibration Fails.

- Check the Cylinder of gas to see if there is gas in inside of the bottle.
- Go to the Diagnostic Mode and check the RAW readings. The sensor may be bad

- **The calibration gas I am using is 10ppm of H2s, but the display says 25ppm. What can I do?**
  - Set the “Span Gas Value” to match the concentration of gas being used.



ToxiRAE 3 - H2s or CO

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- Turning On the ToxiRAE 3 & Navigation (Normal Mode)
- Calibration
  - Enter Programming Menu & Navigation
  - Zero Calibration
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- Warranty Matrix

Diagnostic Mode

The Diagnostic Mode can only be accessed at startup time. In Diagnostic Mode, ToxiRAE 3 displays

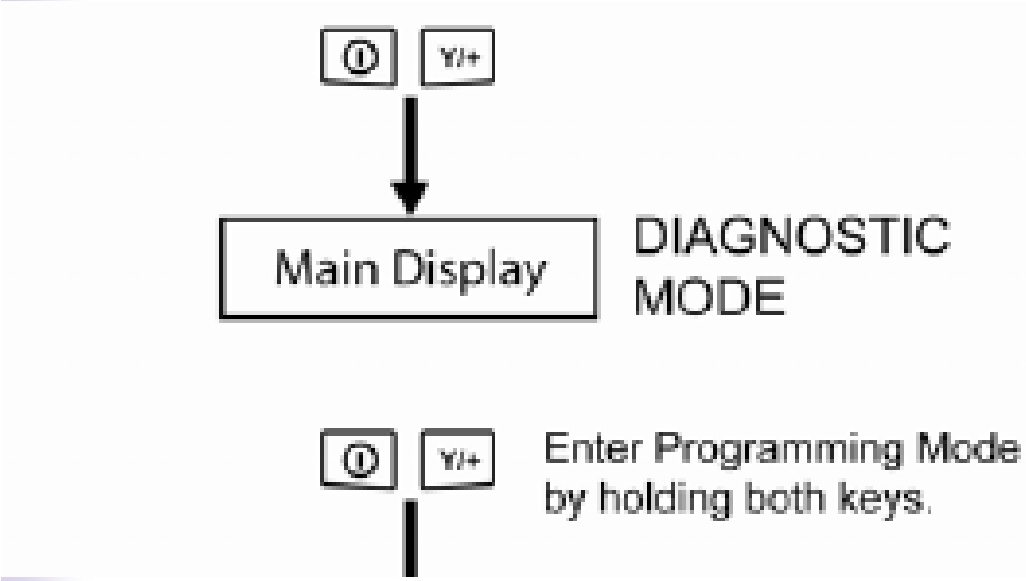
- readings in raw counts instead of units such as parts per million (ppm).
- Alarm minutes

Raw count

Alarm minutes

Diagnostic MODE

The following diagram shows how to enter the Diagnostic Mode.

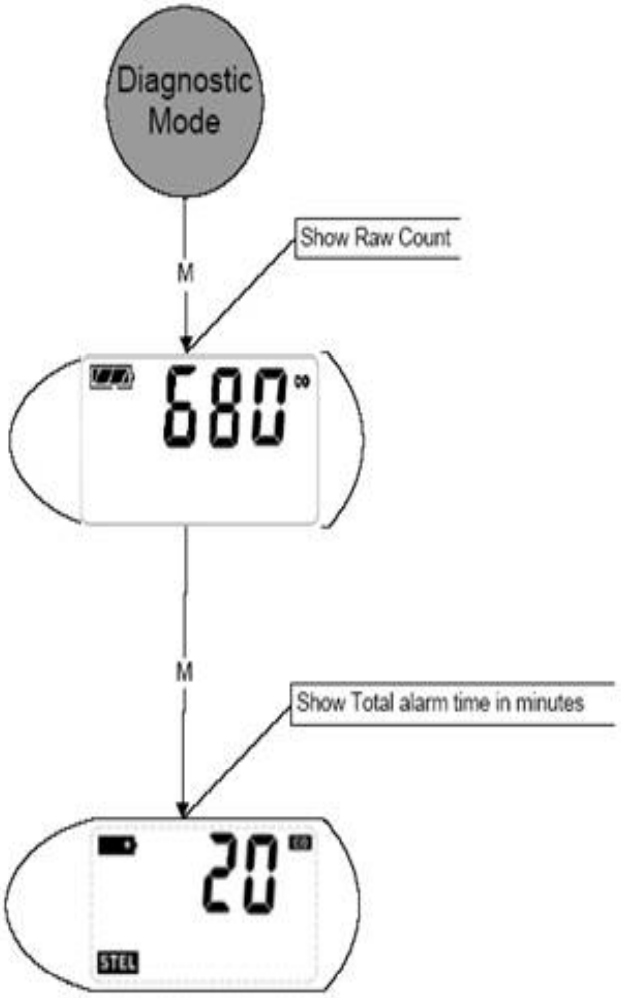


Instrument OFF

Enter the Diagnostic Mode By pressing the [Y/+] and [MODE] keys simultaneously for 3 seconds. Then release.

Diagnostic Mode – Alarm Minutes

- Enter the Diagnostic Mode Press [Y/+] and [MODE] keys simultaneously for 3 seconds.
- After 60 second count down the Display shows the raw counts.
- Press the [Mode] to display alarm time.
- Press [MODE] to return to raw count.
- Press and Hold [MODE] key to turn off.



- *In the event of TX3 battery issue, read the total instrument alarm time as part of the troubleshooting procedure.*
- *Record what is the specified total alarm time.*
- ***Excessive Alarms contribute to shorten battery life.***

Diagnostic Mode -

- The Diagnostic Mode is primarily intended for technicians to use for troubleshooting.

- In Diagnostic Mode, ToxiRAE 3 displays readings in “raw counts” instead of units of measure such as parts per million (ppm)

- Raw Counts are not to be considered specifications. USE only as a guide.

- Raw counts are used to determines sensor’s range and sensitivity to gas.

- The greater the range (Delta Count) the better the sensor. As the delta count decreases, the sensor is losing range or sensitivity. Replace sensor or monitor.

Diagnostic Mode - RAW Count Values

Obtain RAW readings **without** gas applied – Zero Count

Obtain RAW readings **with** gas applied – Span Count

Delta Count = (Span Count minus Zero Count)

Sensor	Calibration Gas	Zero Count (Ambient Air or Zero Gas Air)	Span Count (Calibration Gas Applied)	Delta Count = (Span - Zero Count)
H2S (100)	25 ppm	625-746	995-1586	370-840
CO (500)	50 ppm	656-714	786-1052	130-338

Troubleshooting

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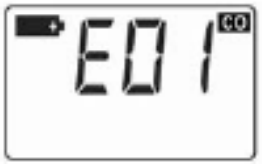
Troubleshooting

Problem	Possible Reasons & Solutions	
Cannot turn on power	**Reasons:**	Depleted battery. Defective battery.
	Solutions:	Replace battery.
Lost password	**Solutions:**	Call Technical Support at +1 408-752-0723 or toll-free at +1 888-723-4800
Reading abnormally Low	**Reasons:**	Calibration Adapter is attached. Incorrect calibration.
	Solutions:	Remove Calibration Adapter. Calibrate the ToxiRAE 3.
Buzzer, LEDs, or vibration alarm Inoperative	**Reasons:**	Bad buzzer, LEDs, or vibration alarm. Blocked alarm port.
	Solutions:	Call authorized service center. Unblock alarm port.

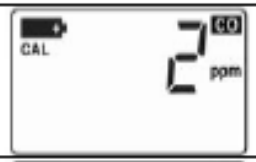
Alarm Signals / Error Messages

Screen	Explanation
	**Sensor Fail Alarm** "E01" flashes once per second. ToxiRAE 3 shuts down if you hold down the [MODE] key.
	Over Range Alarm Buzzer sounds 3 times per second. Vibrates once every other second. "ovr" flashes once per second.
	High Alarm Buzzer sounds 3 times per second. Vibrates once every other second. "High" and "ALARM" flash once per second.
	Low Alarm Buzzer sounds 2 times per second. Vibrates once every other second. "Low" and "ALARM" flash once per second.
	STEL Alarm Buzzer sounds once per second. Vibrates once every other second. "STEL" and "ALARM" flash once per second.

Alarm Signals / Error Messages

Screen	Explanation
	TWA Alarm Buzzer sounds once per second. Vibrates once every other second. "TWA" and "ALARM" flash once per second.
	Negative Alarm Buzzer sounds once per second. Vibrates once every other second. "-0" flashes once per second.
	Battery Low Alarm Battery symbol flashes once per second. "bAt" flashes once per minute.
	Battery Critical Alarm Buzzer sounds once per minute. Battery symbol flashes once per second. "bAt" flashes once per minute.
	Battery Dead Alarm Buzzer sounds once per second for the last minute and then ToxiRAE 3 powers off.

Alarm Signals / Alarm Messages

Screen	Explanation
	Calibration Failure Alarm Buzzer sounds once per second. Vibrates once every other second. "CAL" and "ALARM" flash once per minute.
	**Calibration Due** Buzzer sounds once per minute. "CAL" flashes once per second.
	Bump Test Due Buzzer sounds once per minute. "BUMP" flashes once per second.

TOP Questions about ToxiRAE 3

#	Question	Reason	Solution / Action
1	Unit turns on, then turns off.	**Low Battery**	Replace Battery and reCal. Reset Date/Time via AutoRAE LITE
2	Battery not lasting, WHY?	**Too many Alarms STEL, TWA, CAL, High, Low**	Replace Battery and reCal. Reset Date/Time via AutoRAE LITE
3	purchased instrument about a year ago, battery low. How come?	**Too many Alarms STEL, TWA, CAL, High, Low**	Replace Battery and reCal. Reset Date/Time via AutoRAE LITE. Disable Alarms if needed.
4	Unit in alarm, how come?	**Cal, Bump, TWA, STEL, High or Low**	Turning unit off resets TWA , STEL Re-Calibrate , bad sensor Disable Alarms if needed.
5	Unit is displaying/reading 686 ppm.	**Unit turned on in Diagnostic Mode**	Turn off, turn back on in Normal mode.
6	Unit reads NEG on display.	**Fresh Air Cal performed in dirty environment, sensor poisoned**	Repeat Fresh Air Cal, or Replace unit
7	Unit is blinking CAL, what does that mean?	**Periodic Calibration is Due**	Calibrate Monitor
8	I don't own calibration gas. How do you calibrate this unit?	**Refer to Distributor**	Have distributor calibrate. Disable CAL Alarm if needed.
9	Event logger, the date & time reads zero.	**Battery was replaced without reseting Date/Time**	Use AutoRAE Lite to reset internal clock of ToxiRAE 3
10	Do I need an AutoRAE Lite to reset my Date/Time	**YES**	Contact Distributor or RAE Technical Support

Turn Off Alarms – Who is the End User

Understanding the use

- **Will the instrument remain on 24/7?**
- **How often will the instrument be calibrated?**
- **Does the end user require all Alarms active?**
- **Does the instrument need to be in the "countdown mode."**

e.g. *– end user has a ToxiRAE 3 H2S. Remains on 24/7 per standard operating procedures. End user works longer than 8 hours in a day. Is exposed to H2s, and occasionally will set off Low or High alarms. The user stores the unit in his vehicle overnight. After a few weeks, the instrument is alarming. It has been alarming all night in his vehicle. Gives it to his Maintenance personnel to fix the unit and is issued a new unit. Repeats this every condition every six weeks for about a year. Battery icon flashes in approximately 9 months later.*

- Which Alarm was the original alarm? **TWA**

Turn Off Alarms

IMPORTANT!

Turning Off Alarms: If you set the High Alarm, Low Alarm, STEL Alarm, or TWA Alarm value to 0 (zero), then that alarm is turned off. Make sure that you set an alarm value greater than zero if you want to be alerted to any of these alarms.

- **Fewer Alarms promotes longer battery life**
- **Understand customers use / application before disabling Alarms**
- **If there are alarms not required, set the value to zero (0) to disable alarm**
- **Disabling Alarms is unique to ToxiRAE 3**

ToxiRAE 3 - H2s or CO

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- End

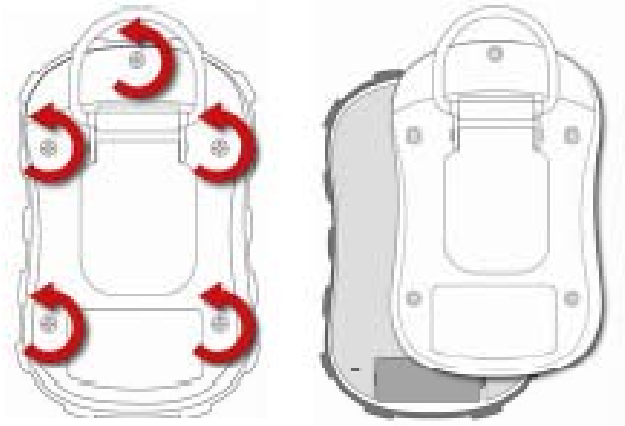
Replacing the Battery

- **Replacing the Lithium Battery**

The TOXIRAE 3 is shipped with the lithium battery installed. Change the battery when the low battery symbol appears. The alarm will beep and flash once per minute until a fresh battery is installed.
Just before the battery dies, "oFF" will appear instead of the reading. The alarm will continue to beep, flash and vibrate for a minute until the battery is dead. If the battery is not completely dead, the user can manually turn the monitor off by pressing the button.

Replacing the Battery – Remove cover

- Unit off.
- Remove the five screws from the back of the monitor.
- Remove the back cover
- Remove the battery
- Remove PCB by lifting straight up.

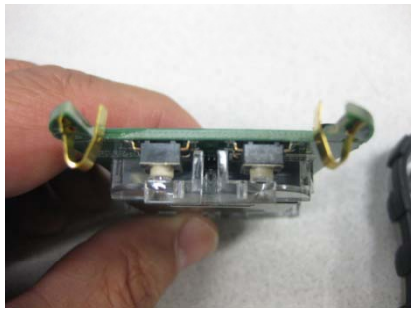


Replacing the Battery – Installing New Battery

- Install new battery in Top Housing
- Inspect Battery contacts
- Insert PCB into Top Housing
- Lightly press PCB onto battery
  - Reason: If battery is installed while PCB is installed, there is a chance that the battery contact may get bent over or damaged.
  - If one contact gets bent over, it will not make contact with the battery.

•NOTE: Internal Clock must be reset if:

- *DataLog data is required,*
- *Clock/Date need for last CAL, etc*
- *Use the AutoRAE Lite to set Date/Clock*

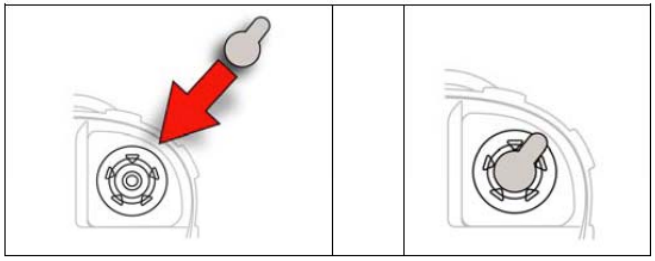


Replacement Parts

Part Number	Description
500-0076-100	Battery, Lithium
G01-2013-100	EXTERNAL REPLACEABLE FILTER,TOXIRAE3, PGM-1700,PACK OF 100
G01-2010-010	CALIBRATION CAP WITH TUBING,TOXIRAE 3, PACK OF 10
	H2S Sensor (H2S100), Mini (not available)
	CO Sensor, Mini (CO500) (not available)

18.2. External Filter

A "peel-and-stick" filter should be used on the ToxiRAE 3 in order to keep debris from fouling the sensor. Sheets of 100 filters (part number G01-2013-100) are available. Peel a filter from the sheet and center it over the sensor. Gently press down. When the filter appears dirty, replace it with a new one and dispose of the dirty filter.



Warranty Matrix

ToxiRAE 3 User's Guide

Year of Manufacturing

To identify the year of manufacturing, please refer to the serial number of the instrument.
The second to last digit in the serial number indicates the year of manufacturing. "H" indicates the manufacturing year is 2007.

First digit	Year
H	2007
J	2008
K	2009
M	2010
N	2011
P	2012
Q	2013
R	2014
S	2015
T	2016
U	2017
V	2018
W	2019

Sample Test Record

ToxiRAE 3 - H2S / CO		Pre - Readings							Post Calibration Data				
Serial Number	Frmwr	RawZero	RawSpan	Delta RAW	Alarm Minutes	Zero Air Reading (ppm)	Span Bump (ppm)	Alarm Min1	zero Cal	Span Cal	Bump (ppm)	Alarm Min2	Comment1

Repair Date: _____

Repaired by:_____

QUESTIONS

END

NOTES

NOTES